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HAND INJECTOR FOR LIQUID SOIL INSECTICIDES[1/]

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A hand injector has been developed for the injection of small volumes of liquid insecticides into balled and burlaped nursery stock to destroy the immature stages of the Japanese beetle (Popillia japonica Newm.) in the soil about the roots of the plants. This paper describes the general construction and operation of this injector, which is a modification of a commercial caulking gun with a lever action-cocked plate.

Construction

The assembled injector is shown in figure 1, and the nozzle, assembled and disassembled, in figure 2.

The protective sleeve (A) is of brass 3 1/4 inches long and 5/16 inch in diameter, with a bore 2/1000 inch larger than 1/4 inch to within 1/4 inch of the tip, where it is 3/16 inch. The lower 1/4 inch of the outside of the sleeve is tapered from 5/16 inch to 3/16 inch. At the top of the sleeve is a collar 5/8 inch long with an outside diameter of 7/16 inch to within 1/16 inch of the end, where it is 5/8 inch.

The injector tube (B), of brass with a pointed steel tip, is 4 1/4 inches long. The outside diameter is 1/4 inch to within 1/2 inch of the lower end, and then 3/16 inch to within 1/16 inch of the steel tip, where it tapers to 1/8 inch. The inside bore is 3/32 inch. Four 1/16-inch holes are drilled in the tube immediately below the point where the outside diameter is decreased to 3/16 inch; only one of these holes is shown in figure 2. The steel tip, 1/2 inch long, having a shank 3/32 inch in diameter and 3/8 inch in length and a head 1/8 inch in diameter beveled to a point, is forced into the lower end of the injector tube so that the head is in close contact with it. There is a 1/4-20 thread 1/2 inch long at the upper end of the tube.

The sliding top (C) for the protective sleeve (A) is made of 1/8-inch steel 3/4 inch wide and 2 1/2 inches long, bent into a U-shape with arms

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1/ L. B. Parker, of the Japanese beetle laboratory, took the photograph.

3/4 inch long. The hole in the center of the upper arm is 3/8 inch in diameter and that in the lower arm 29/64 inch. The release (D) for the protective sleeve (A) is made of 16-gage steel 1 1/4 inches long and 1/2 inch wide, with a hole 9/32 inch in diameter in the center. E is a 1/4-20 hexagonal nut, and F is a flare nut of brass having the lower end bored with a 1/4-20 thread.

The liquid-pressure valve (G), with an inside bore of 9/32 inch, is threaded on each end for connecting to the flare nut (F) and the 1/4-inch iron pipe tee (H). A ball seat of brass 9/32 inch in diameter and 1/8 inch long with a 3/16-inch bore is pressed into the upper end, and a spring stop of the same dimensions into the lower end of the pressure valve. I is a steel spring 1/4 inch in diameter and 1 1/4 inches long and J a steel check ball 7/32 inch in diameter, both functioning within the pressure valve. There is a brass petcock (K) on the tee to which flexible tubing is connected for loading the injector.

A wing-nut adjustment (L) on the injector handle regulates the distance the trigger (R) can be moved and thus the volume of liquid discharged. M is the piston rod and N the latch for the recoil plate (O). When the recoil plate is inserted under the latch, the piston rod can be moved without engaging the trigger (R).

The lower cap (P) of the barrel (Q) is threaded and screws onto the barrel. The original washer in this cap did not have enough bearing surface on the end of the barrel to make the union sufficiently tight to confine liquids. This difficulty was remedied by fitting a sleeve 1/4 inch long, made from 2-inch copper tubing, into the lower end of the barrel.

Operation

To load the injector with a liquid insecticide, the petcock (K) is opened, the end of the recoil plate (O) is inserted under the latch (N), and the piston rod (M) is pushed into the barrel (Q) for the full distance to expel the air. A piece of flexible tubing is put on the petcock. With the lower end of the flexible tubing in the liquid insecticide, the injector is held with the nozzle downward and the piston rod (M) is slowly withdrawn; thus the liquid insecticide is pulled into the barrel (Q). The petcock (K) is then closed, the flexible tubing removed, and the recoil plate (O) released from the latch (N). The recoil plate should always be released when the injector is operated to engage the trigger mechanism. The injector is held with the nozzle pointing upward. The trigger (R) is then pressed two or three times until the liquid insecticide is discharged from the nozzle tip. This operation expels any air and fills the injector tube with liquid. When filled completely, the injector holds 380 ml. of liquid insecticide.

The amount of liquid discharged is regulated by the distance the trigger is moved. The injector can be set to deliver 2 to 8 ml. of liquid per discharge. The setting of the wing-nut adjustment (L) on the injector handle to discharge a definite amount of liquid is a trial-and-error process. For example, if approximately 4 ml. per discharge is desired, the injector should be discharged 10 times into a graduated cylinder and the volume determined. If the volume of discharge is not between 40 and 45 ml., the wing-nut adjustment (L) should be reset and the process repeated until this volume is obtained in three successive trials. After the desired setting of the wing-nut adjustment has been obtained, the amount delivered by the injector should be rechecked from time to time, preferably each day.

To inject the liquid insecticide into balled and burlaped nursery stock, the injector tube is first inserted into the soil to a depth of approximately 3 inches, then withdrawn about 1/2 inch until the lower side of the collar on the protective sleeve (A) strikes the lower arm of the sliding stop (C). In this way the protective sleeve remains stationary in the soil, and the injector tube (B) is withdrawn into it, leaving a space for the discharge of the liquid. The trigger is then pressed to discharge the liquid, and the injector is withdrawn from the soil.

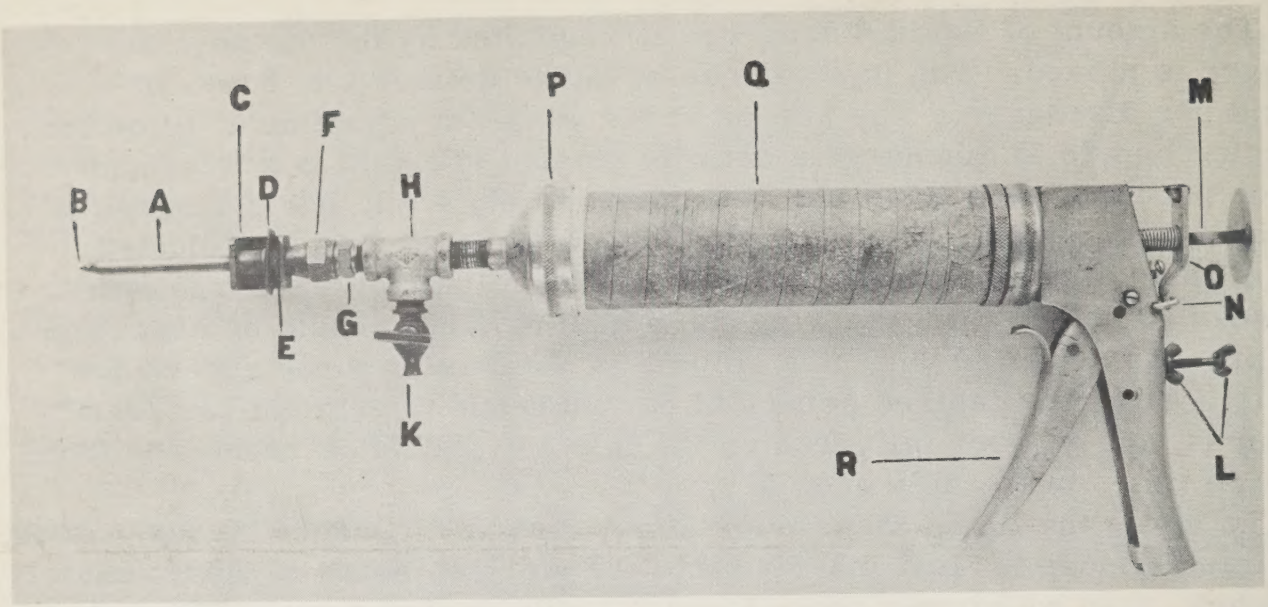

Figure 1.--Assembled hand injector for liquid soil insecticides.

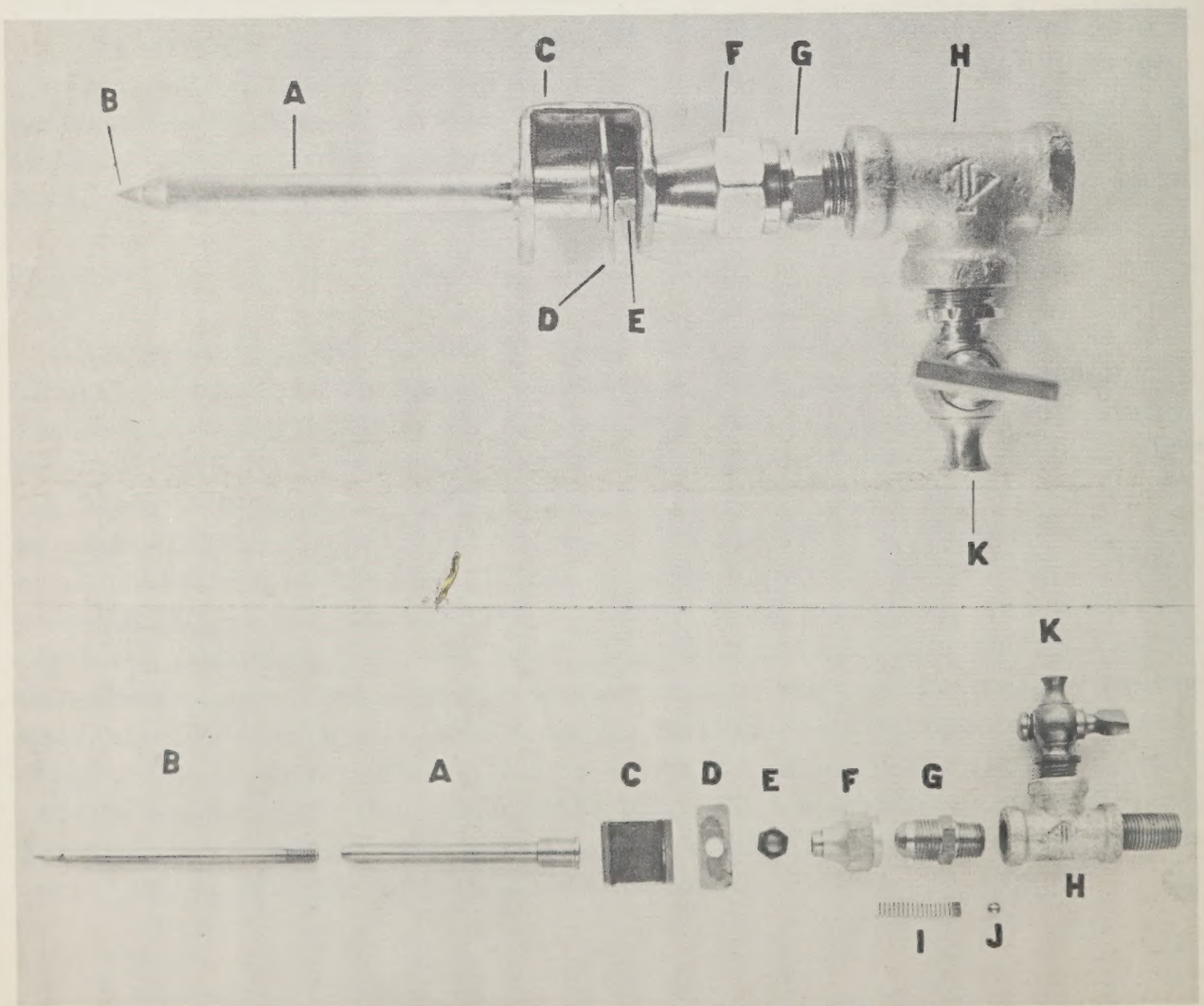

Figure 2.--Details of the nozzle. Top, assembled; bottom, disassembled.